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ABSTRACT

Support for science instruction has been increasing in Jordanian schools within the past two decades. Science is studied throughout all three levels of schooling. Corresponding with this growth in science education are improved programs for science teacher training. Inservice programs are offered to raise levels of teacher competence and effectiveness. The purpose of this study is to identify the most prevalent inservice needs of Jordanian secondary level science teachers and to determine if these needs differ by specialty areas. This report includes: (1) procedures of the study; (2) data collection information; (3) research findings; and (4) concluding remarks. The report indicates that the most prevalent needs were associated with science instruction delivery, facility and equipment administration, and improvement of competence levels for science teachers. Comparisons are made with secondary level science teachers from the United States. Tables of survey statistics are also included. (ML)

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JORDANIAN SCIENCE TEACHERS' PERCEIVED NEEDS: AN ASSESSMENT, ANALYSIS AND COMPARISON*

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Abstract

The purpose of the study was to identify the most prevalent needs perceived by Jordanian secondary level (U.S. grades 10-12) science teachers, and to search for the existence of patterns which previously had been revealed in the needs of U.S. samples. The Science Teacher Inventory of Need (STIN) was used to collect data (an 83 item instrument which has content validity, construct validity, and 0.95 coefficient alpha reliability for assessing the perceived need of secondary level science teachers in developing nations). The accessible population consisted of the 444 secondary level science teachers in four of the five districts of Jordan. The STIN was carried to the teachers at school, and returned via school principals. A sample of 365 teachers (82.2%) returned completed inventories. The data were analyzed by calculating descriptive statistics (i.e., means, standard deviations) on STIN items for the entire sample and subgroups established by science teaching specialization, i.e., general science, biology, chemistry, physics. The most prevalent perceived needs (top 20 STIN items by mean response value) came mainly from three STIN item categories--Delivering Science Instruction, Administering Science Instructional Facilities and Equipment, and Improving One's Competence as a Science Teacher. Twelve of the most prevalent perceived needs were shared across the four science teaching specialization subgroups, while 20 other needs were unique to the respective subgroups. These patterns of

perceived need are similar to ones found among two samples of American secondary level science teachers in recent studies. It is recommended that the identified needs be emphasized in Jordanian science teacher inservice and preservice training, and that further study of science teacher perceived needs within and across populations be conducted to further establish the existence of the patterns revealed in this study and to search for others.

JORDANIAN SCIENCE TEACHERS' PERCEIVED NEEDS: AN ASSESSMENT, ANALYSIS AND COMPARISON

Introduction

Science has become a major instructional thrust in the schools of Jordan over the past two decades, as it has in most developing countries. Science is studied by all Jordanian students throughout the three levels of schooling. Elementary students (U.S. grades 1-6) and preparatory level students (U.S. grades 7-9) study general science for three and four periods per week, respectively (The standard period is 45 minutes in length). Tenth grade students receive four periods of physical science instruction and two periods of biology instruction per week. After the tenth grade, where the secondary curriculum is divided into a scientific stream and a literary stream, science course work differentiates. Students in the scientific stream study physics four periods per week, chemistry three periods per week and biology two periods per week in grades 11 and 12. Literary stream students receive three periods of general science instruction per week in grades 11 and 12. (Foudeh & Shami, Note 1)

With the emphasis on science instruction has come a need for more and better trained science teachers, and the acceptance of inservice education as a means for increasing the effectiveness of practicing science teachers. A 1964 law called upon the Jordanian Ministry of Education to provide educational opportunities for teachers of public and private schools in order to raise their level of professional competence (Ministry of Education, Note 2). In 1971 the Ministry acted on this legislated mandate by

establishing the Certification and Inservice Teacher Training Institute (CITTI).

The Problem

In the first decade of its operation, the CITTI addressed the educational deficiencies of elementary and preparatory school teachers who did not hold an Associate Degree from a preservice teacher training institute, and so were not certified. Coursework which led to an Associate Degree and teacher certification was offered to such underqualified teachers by the CITTI.

With minimal certification of Jordanian teachers at hand, the CITTI has moved into a second phase of operation. In this second phase, inservice training is being provided to certified teachers and administrators to raise their level of professional competence.

Antithetic to the development of CITTI inservice programs for Jordanian science teachers is a lack of empiricial research on the needs of these teachers. To date the inservice activities which have been offered to Jordanian science teachers have been based entirely upon "expert" opinion (Al-Khateeb, Azzam, Hassan, Kakish, & Khattab, Note 3). It would appear a cardinal rule of teacher inservice education--that inservice programs should be based upon the perceived need of the teachers who will participate in the program (Edelfelt & Johnson, 1975; Tyler, 1974)--has been overlooked. Hence, the first purpose of this study was to identify the most prevalent needs perceived by Jordanian secondary level (U.S. grades 10-12) science teachers.

The second purpose of the study was to determine the degree

of uniqueness, if any, which exists among the most prevalent needs perceived by Jordanian secondary level science teachers. Recent studies of science teacher needs with U.S. samples (Moore, 1978; Rubba, 1981) have revealed that secondary level science teachers share a number of perceived needs, while they also have distinct needs according to the science discipline taught. In this study the researchers also sought to test the generalizability of those findings to the Jordanian secondary level science teacher population.

In Summary, the following two research questions were investigated:

1. What are the most prevalent perceived needs of Jordanian secondary level science teachers?
2. Do the most prevalent perceived needs of Jordanian secondary level science teachers differ by the teachers' area of science teaching specialization, i.e., general science, chemistry, physics?

Procedures

Instrument

The Science Teacher Inventory of Need (STIN), an instrument developed specifically to assess the needs of science teachers in developing nations, was used to solicit an answer to the research questions. The procedures used to develop and validate this instrument are described elsewhere (Zurub & Rubba, 1983). The essential characteristics of the STIN are recounted below.

The STIN is composed of 83 items grouped under the following seven categories:

A. Specifying Objectives for Science Instruction

B. Diagnosing and Evaluating Learners for Science Instruction

C. Planning Science Instruction

D. Delivering Science Instruction

E. Managing Science Instruction

F. Administering Science Instructional Facilities and Equipment

g. Improving One's Competence as a Science Teacher.

Seventy-six of the items describe a comprehensive set of tasks and activities science teachers are called upon to perform in the course of carrying out their instructional duties. Each of these items consists of a task description which has attached to it the coded scale "NF 1 2 3 4" (where NF = not familiar with the task, 1 = no need, 2 = little need, 3 = moderate need, and 4 = great need). A blank is included in each of these items which respondents can use to clarify the nature of any item associated need or to list specific topics of interest. At the end of each of the seven categories of items there is an open-ended item which respondents can use, if they wish, to register a need they could not fit into any of the other items in the category. In completing the STIN, respondents circle the appropriate code following each item and add explications as desired.

The STIN was judged to be content valid by a panel of seven experts. Evidence of its construct validity was obtained using principal-component factor analysis with varimax rotation (Gorsuch, 1974; Rummel, 1970). That procedure yielded nine interpretable factors which accounted for 84.9% of STIN variance.

The coefficient alpha and split-half methods (Ary, 1979; Nunnally, 1967) were used to determine STIN reliability. Both methods yielded values of 0.95.

For the purposes of this study, a perceived need was defined as a discrepancy between what an individual wants and what he/she has (Burton & Merril, 1977, p. 24). The most prevalent needs were defined as the top 20 STIN items designated by the sample based upon mean responses values.

Sources of Data and Data Collection

The researchers distributed the STIN to an accessible population consisting of the 444 secondary level science teachers in four of the five districts of Jordan, including Amman, Balqa, Irbid and Karak. The 11 secondary science level teachers in Maan district were not included in the study because of the inaccessibility of the area.

The STIN was carried to the science teachers at their schools. Cover letters from Jordanian Ministry of Education personnel and the researchers asked the teachers to complete the inventory and to return it to their school principal within two weeks. The principals mailed the completed inventories to the researchers. Teachers were given the option of placing their names on the STIN.

Completed inventories were returned by a sample of 365 teachers. That number represented 82.2% of the secondary level science teachers in the four districts, and included science teachers from 96% of the general secondary schools in Jordan. The sample included 169 females and 196 males. Tables I and II show

the distributions of the sample by Jordanian district and area of specialization, respectively.

Insert Tables I & II about here

The STIN was scored as is recommended by its developers, by completing frequency counts on the "NF" responses and by calculating the mean of the "1 2 3 4" responses for each item (Zurub & Rubba, 1983).

Findings

Table III is a rank ordered list of the top 20 perceived needs (STIN items) designated by the total sample of Jordanian secondary level science teachers, and by those in the sample with a teaching specialization in general science (n=90), biology (n=82), chemistry (n=85), and physics (n=53). Also, displayed are means and standard deviations of responses to STIN items designated by the sample and the respective science teaching specialization subgroups. In total, 32 perceived needs (STIN items) are presented in Table III.

Insert Table III about here

Conclusions and Discussion

The data presented in Table III show that irrespective of whether one considers the most prevalent perceived needs of the entire sample of Jordanian secondary level science teachers or the

respective science teaching specialization subgroups, those needs come mainly from three STIN categories--Category D, Delivering Science Instruction, Category F, Administering Science Instructional Facilities and Equipment, and Category G, Improving One's Competence as a Science Teacher. In fact, 16 of the top 20 (most prevalent) perceived needs of the entire sample come from these three categories, with four needs from Category D, seven needs from Category F, and five needs from Category G. Similarly, 19 of the general science teachers' and the biology teachers' top 20 perceived needs, and 17 of the chemistry teachers' and the physics teachers' top 20 perceived needs fall into Categories D, F, or G.

Looking across the science teaching specialization subgroups, 12 of the top 20 perceived needs designated by the entire sample are shared. Those 12 shared needs are, in rank order as designated by the entire sample: F1. Organize a science laboratory room, G9. Update one's knowledge of man's utilization of science/technology, E2. Provide for students' safety in the laboratory, G16. Work towards a degree in science education, D1. Motivate students to learn science, F3. Maintain science laboratory equipment, F7. Select supportive materials (library books, films, etc.) for science instruction, F6. Identify sources of free and inexpensive science instructional materials, F5. Select science laboratory equipment for student use, G13. Update one's background in curriculum development, D3. Conduct a science laboratory session, and G10. Update one's knowledge of science related career opportunities for students.

Completed inventories were returned by 82.2% (n=365) of the

science teachers in the districts of Amman, Balqa, Irbid and Karak. That sample included science teachers from each of the 337 general secondary schools in the four districts and 80.2% of the secondary level science teachers in Jordan. From the first author's experience working in Jordan the 11 secondary level science teachers from the Maan district do not differ significantly from those in the other four districts except in terms of their accessibility. Thus, the conclusions stated above for the sample are considered to be generalizable to the entire population of Jodanian secondary level science teachers.

The perceived needs which were determined in this study to exist among Jordanian secondary level science teachers have implications for science teacher training in Jordan, not only at the inservice level, but also at the preservice level. The areas designated as prevalent perceived needs would appear to be ones upon which greater emphasis should be placed during preservice secondary level science teacher training, and which should be dealt with in inservice training activities for secondary level science teachers, such as those offered by the CITTI.

Beyond the 12 perceived needs which are commonly shared by the Jordanian secondary level science teachers, Table III shows there exist 20 prevalent perceived needs which are not shared across each of the four science teaching specialization subgroups. Needs from that group of 20 compose a unique set of needs for each science teacher subgroup. This pattern in the perceived needs of the Jordanian secondary level science teachers is congruent with ones observed by Moore (1978) and by Rubba (1981) within the perceived needs of secondary science teachers from the U.S., and

so, extends the generalizability of that finding. The secondary level science teachers surveyed in the respective studies shared a common set of perceived needs, plus each science teaching specialization subgroup exhibited needs which were unique to that area, e.g., biology, chemistry.

One finds other similarities when the science teacher needs identified in this study are compared with those of secondary level science teachers from the U.S. Moore (1978), who used a sample from Harris County, Texas, and Rubba (1981), who used a sample from across Illinois. found secondary level science teachers' most prevalent perceived needs fell mainly into four areas:

1. improvement of classroom instruction;
2. development of a better understanding of students;
3. more effective use of instructional materials;
4. the self-improvement of the science teacher.

Again, the most prevalent needs of the Jordanian science teachers fell mainly into the following three areas:

1. delivering science instruction;
2. administering science instructional facilitities and equipment;
3. improving one's competence as a science teacher.

The exact sets of needs noted in these areas differed across the populations of science teachers. Still, both the American and Jordanian secondary level science teachers expressed needs in the areas of delivering science instruction and science teacher self-improvement.

Given the similarities in patterns of perceived needs

revealed in this study between Jordanian and American secondary level science teachers, further study of science teacher perceived needs within and across populations is suggested to establish the existence of these patterns, to search for other patterns, and to seek their causes.

Reference Notes

Note 1 Foudeh, H. M., & Shami, M. A. Educational development from 1976-1979 in Jordan. Amman: Ministry of Education, 1979.

Note 2 Ministry of Education. Certification and training by law No. 50 of 1971. Amman: Ministry of Education, 1971.

Note 3 Al-Khateeb, A., Azzam, A, Hassan, M. Kakish, I. & Khattab, M. In-depth evaluation study of the inservice teacher training project in Jordan. Amman: Ministry of Education, 1979.

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Table I

Distribution of the Sample by Jordanian District

District	Inventories Delivered	Inventories Returned	Percent of Returns
Amman	171	138	80.7
Balqa	45	36	80.0
Irbid	188	176	93.6
Karak	40	15	37.5
Total	444	365	82.2

Table II

Distribution of the Sample by Teaching Specialization

Specialization	n	%
Biology	82	22.5
Chemistry	85	23.3
Earth Science	9	2.2
General Science	90	24.7
Mathematics	14	3.8
Physics	53	14.5
Other	28	7.7
No/Blank Response	4	1.1
Total	365	100.0

Table III

Descriptive Statistics on Jordanian
Science Teachers' Most Prevalent, Perceived Needs

STIN Category, Item/Need		Overall n=365		General n=90		Biology n=82		Chemistry n=85		Physics n=53	
		Rank	X SD	Rank	X SD	Rank	X SD	Rank	X SD	Rank	X SD
F1. Organize a science laboratory	F1.	1	3.49 .98	7	3.35 .91	5	3.45 1.04	3	3.44 1.05	10	3.27 1.13
G9. Update ones' knowledge of man's utilization of science/technology	G9.	2.5	3.46 .99	1	3.57 .66	6	3.44 .83	8	3.29 .94	3	3.44 .79
G16. Work towards a degree in science education	G16.	2.5	3.46 .83	2	3.56 .71	15.5	3.34 .92	4	3.42 .86	5	3.36 .94
E2. Provide for students' safety in the laboratory	E2.	4	3.42 1.03	4.5	3.42 1.06	10	3.38 1.07	5	3.39 1.00	11.5	3.25 1.11
D1. Motivate students to learn science	D1.	5	3.39 1.07	8.5	3.38 1.06	7	3.39 1.09	9	3.28 1.10	9	3.29 1.12
F3. Maintain science laboratory equipment	F3.	6	3.38 1.08	10	3.36 1.07	17	3.31 1.16	6.5	3.33 1.09	4	3.38 1.11
F7. Select supportive materials (library books, films, etc.) for science instruction	F7.	7	3.37 .95	15	3.29 .97	3.5	3.46 .98	6.5	3.33 1.00	8	3.30 .97
F6. Identify sources of free and inexpensive instructional materials	F6.	8	3.33 .94	13	3.34 .94	8	3.39 .98	16.5	3.20 .95	6.5	3.31 .96
D15. Use audio-visual equipment to support science instruction	D15.	9	3.30 1.00	8.5	3.38 .93	3.5	3.46 .91				
F5. Select science labpratory equipment for student use	F5.	10.5	3.29 .98	14	3.33 .93	11	3.37 1.00	11	3.23 .93	13.5	3.19 1.07
G13. Update ones' background in curriculum development	G13.	10.5	3.29 .84	18.5	3.26 .85	8.5	3.39 .79	12	3.22 .86	18	3.17 .98
F8. Maintain live organisms for science instruction	F8.	12.5	3.28 .97	20	3.22 .91	12.5	3.36 1.07	14	3.21 1.06		
D3. Conduct a science laboratory session	D3.	12.5	3.28 1.03	19	3.23 .94	18	3.28 1.11	10	3.27 1.04	20	3.12 1.11
D16. Use area/regional resources to support science instruction	D16.	14	3.27 .85			14	3.35 .95	18	3.18 .93		

Table III Continued

STIN	Category, Item/Need		Rank	X SD	Rank	X SD	Rank	X SD	Rank	X SD	Rank	X SD
G10.	Update ones' knowledge of science related career opportunities for students	G10	15	3.27 .92	17.5	3.26 .79	12.5	3.36 .86	14	3.21 1.06	16	3.18 .83
E5.	Communicate student learning progress to the student, administrators and parents	E5.	16.5	3.26 .85	11.5	3.35 1.07						
F4.	Construct science laboratory equipment	F4.	17.5	3.26 1.07			19.5	3.19 1.07	6.5	3.31 .85		
G2.	Update ones' scientific knowledge in chemistry	G2.	18	3.23 1.07	4.5	3.42 1.06			1	3.51 0.91		
C7.	Arrange the physical environment for science instruction	C7	19	3.22 .97					19.5	3.19 .92	13.5	3.19 .93
A2.	Establish a science curriculum/program	A2.	20	3.21 1.03					16.5	3.20 .96		
G1.	Update ones' scientific knowledge in biology	G1.			4.5	3.42 .91	1.5	3.63 .91				
G5.	Update ones' scientific skills in biology	G5			16	3.28 1.01	1.5	3.63 .81				
F2.	Set up a laboratory supply order, storage and retrieval system	F2.					15.5	3.34 1.01	14	3.21 .92		
D18.	Use a library/media center to support science instruction	D18.					19.5	3.27 .91				
D7.	Demonstrate a science manipulative skill	D7.					20.5	3.27 .99				
G6.	Update ones' scientific skills in chemistry	G6.							2	3.45 .93		
G4.	Update ones' scientific knowledge in physics	G4.			4.5	3.42 1.06					1	3.66 .76
G8.	Update ones' scientific skills in physics	G8.			11.5	3.35 .93					2	3.54 .89
B3.	Use assessment data to diagnose science learning difficulties (physical, intellectual, social, emotional)	B3.									11.5	3.25 .99

Table III Continued

STIN	Category, Item/Need		Rank	X SD	Rank	X SD	Rank	X SD	Rank	X SD	Rank
B2.	Use assessment data to determine student readiness for science instruction (physical, intellectual, social, emotional)	B2.									16 3.
G12.	Update ones' background in theories of cognitive development, leaning and instruction	G12.									16 3.
G11.	Update ones' knowledge of science related societal issues	G11.									19 3.